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Vol. 18, No. 4 PSYCHOLOGICAL REVIEW PUBLICATIONS April, 1921

# Psychological Bulletin

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PUBLISHED MONTHLY BY THE

PSYCHOLOGICAL REVIEW COMPANY
41 NORTH QUEEN ST., LANCASTER, PA.,
AND PRINCETON, N. J.

Agents: G. E. Stechert & Co., London (2 Star Yard, Carey St., W. C.); Paris (16, rue de Condé)

Entered as second-class matter January 21, 1904, at the post-office at Lancaster, Pa., under the Act of Congr of March 3, 1879

# Psychological Review Publications

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Vol. 18, No. 4. April, 1921

THE

PSYCHOLOGICAL BULLETIN

# CUTANEOUS AND KINESTHETIC SENSES

BY JOHN T. METCALF

*George Washington University*

The review which follows is undertaken with the purpose of bringing together the most important contributions that have been made to our knowledge of the cutaneous and kinesthetic senses within the last decade, 1911 to 1920, both inclusive. It is based chiefly upon the summaries which have appeared in this BULLETIN from year to year. These are listed by number at the end of this review, and numbers in parentheses following citations of literature refer usually to the reviews in which the original articles were summarized. The first of the yearly reviews included was written by Professor R. P. Angier, the others by the present reviewer. In addition, the references include the titles of the literature of the past year and also those of certain recent text-books.

There are several outstanding features in the work that has been done on cutaneous and kinesthetic sensations during the last ten years. Of these perhaps the chief ones are the evaluation of the Head theory of cutaneous sensibility, investigation of the temperature senses, especially of the complex cutaneous quality called heat, some work of great significance for kinesthesia, and a quite recent awakening of interest in the hitherto somewhat neglected static sense.

The Head theory, advanced during the latter part of the preceding decade, received immediate recognition and widespread acceptance among psychologists. The significance of the line of work it initiated and the influence it still exerts perhaps justify a brief sketch of the principal features of the theory itself and an outline of the most important evidence for and against it. The facts on which it was founded were derived from two chief sources:

investigations of pathological cases in which nerves were undergoing regeneration, and the experiment in nerve-division which Head carried out upon himself.[1] As a result of these two lines of inquiry Head was led to assume that the normal skin is supplied by two systems of sensory fibers. The two systems are generally found together, but dissociation may occur. They are assumed to have developed at different times in the process of evolution. To the genetically older system the term "protopathic" is applied, and the other supposedly more refined and more recently developed one is called "epicritic." In addition to these there is also, of course, the system of "deep" or subcutaneous sensibility. The fibers of the "protopathic" system are supposed to mediate sensations from the hairs, cutaneous pain, and more intense degrees of warmth and cold. Those of the "epicritic" system mediate sensations of pressure, warmth, and cold of less intensity. The "epicritic" system is supposed to exercise an inhibitory function over the "protopathic" and it is also supposed to make possible localization and tactual discrimination, functions which the "protopathic" system by itself cannot perform.

This hypothesis was advanced to interpret all the facts of cutaneous sensibility, and more especially to account for the sensory peculiarities of skin areas supplied by regenerating nerves. Of these latter, the chief ones may be briefly designated as spatial and temporal dissociation of certain forms of sensibility, hyperesthesia, and remote reference. When a nerve has been severed, the skin areas affected for different forms of cutaneous sensibility are found not to be uniform. Insensibility to light touch and other "epicritic" stimuli is usually more widespread than sensory loss for the "protopathic" system, though Head finds evidence that the "epicritic" system may be functioning in areas where the "protopathic" is not active. Again, the return of the two different kinds of sensibility to the affected area is found to occur at different times. "Protopathic" sensibility returns to the affected area first. When this has occurred the area is sensitive to stimuli of certain intensity, much above the normal threshold, but not to finer degrees of stimulation. At this stage the sensations aroused are found to be abnormally intense; also, stimuli to a given point are apt to be referred to a different point, often some distance away. The intensification of sensation Head attributes to the absence of the normal inhibitory effect which the "epicritic" system is supposed

[1] *Brain*, 1905, 28, 99 ff., 116 ff.; 1908, 31, 323 ff.

to exercise over the "protopathic." Remote reference of the point of stimulation is interpreted as the imperfect performance of the "protopathic" system, which is supposed to be inadequate to the function of localization in the absence of the "epicritic."

Even before the beginning of the period covered in general by this review Head's theory had been subjected to critical analysis. The most significant contribution from the point of view of psychology was that of Trotter and Davies which appeared in 1909.[1] These investigators extended Head's experiment by severing several sensory nerve-trunks in themselves and examining the characteristics of the affected areas as they gradually returned to normal sensibility. Their methods of exploration, while in some respects an improvement upon those of Head, were still hardly up to the standard required for exact psycho-physical investigation. Their results differ from Head's in several important respects. The boundaries for the areas of sensory loss of different kinds just about coincide. All kinds of cutaneous sensibility begin to return together, except warmth which is somewhat delayed. This delay, however, they believe to be more apparent than real, and mainly due to the difficulty of exact demonstration. They find that all forms of sensibility begin to return in hypoesthetic form, that is, their thresholds are abnormally high. They believe that this hypoesthesia is the real reason why Head found fine sensibility absent at first. These experimenters also find the phenomena of intensification and remote or peripheral reference, but they interpret them very differently. The former, they think, is a hyperalgesia, due to an irritative change resulting from the process of recovery in the nerve-trunk. The latter they attribute to a supposed lack of connection between the regenerating fibers and the sense-organs of the skin. As long as imperfect localization persists, they think, the fibers are being directly stimulated. Power of localization is recovered when connection is reëstablished between the regenerating axis-cylinders and the end-organs through which they are normally stimulated. Although the result of this investigation is, in the main, negative, it constitutes an important experimental critique of the Head theory.

von Frey (4) regards the study of areas in which cutaneous sensibility has been permanently changed as at least a valuable supplement to the study of areas temporarily affected. He made an experimental study of a permanently hypoesthetic area on his

[1] *J. of Physiol.*, 1909, 38, 134 ff.

own thigh. When this area was tested it was found that it had only about 10 per cent. of the number of sensitive spots normal to the region. These spots, however, were found to have normal thresholds, though the area as a whole was somewhat hyperalgesic. Single pain spots were found to have normal thresholds, though they reacted abnormally slowly and discrete stimuli were found to give rise to summating effects. Thus when a stimulus covering a number of spots is applied it is sensed as abnormally intense. This phenomenon is similar to the intensification found by Head and by Trotter and Davies. Accuracy of localization in the affected area is found to be relatively low. Stimuli are often remotely referred, and sometimes several points are related to each other in such a way that stimulation to any one may be referred to any of the others. Localization of temperature stimuli is very poor, and summation in the case of warmth or cold seldom occurs. This study of an area very sparsely supplied with normal sensitive spots suggests an interpretation of intensification without assuming Head's two systems, and indicates that remote reference is not due to the absence of the supposed "epicritic" system, since it occurs in the case of spots with normal thresholds.

Hacker (4) extended Head's method in still another way. He produced an area of anesthesia by the injection of a solution of iodine. The shape of the area showed its anesthesia to be due not to the spread of the solution, but to the solution's effect upon the nerve-trunk. The area remained anesthetic for about two months. As it regained its normal sensibility the single points always reappeared with normal thresholds. Trotter and Davies had found threshold values higher than normal in areas of returning sensibility. Hacker criticizes them on the ground that their stimuli were not fine enough to investigate single spots. With their stimuli, he holds, the result which they obtained was the natural one in an area with less than its normal number of sensitive spots.

Head's conclusions were examined and criticized in the light of Head's own experimental results by Carr (6). The latter tabulated the results in a systematic way and pointed out that an impartial observer would have as much ground for concluding that there are seven variables as he would for concluding that there are two. He indicated also that the assumption of seven systems is further supported by various characteristics of distribution of sensibility, certain parts of the body lacking one or more of the seven forms. He then raised the question of whether or not the seven forms might

be reduced to the conventional four and concluded that such a reduction was possible. He thinks that the phenomena of dissociation may be better interpreted as due to two stages of recovery of the same mechanism than as the effects of the separate recovery of two. He does not offer an explanation for the phenomena of intensification and remote reference, but calls attention to the fact that in investigations of this sort the experimenters are dealing with cutaneous tissues which are in an extremely abnormal condition.

From the point of view of experimental psychology the methods used to test the affected areas by von Frey and by Hacker are a great improvement upon those of Head and of Trotter and Davies, but their work is not strictly comparable with that of the other experimenters because of the difference in neurological condition of the areas examined. Boring (6) repeated Head's experiment, bringing to the investigation a long experience in the introspective analysis of tactual sensations and using greatly improved methods. The nerve chosen for section was the anterior branch of the internal cutaneous of the investigator's left fore-arm. The result of the operation was the disappearance of sensibility in a small area on the volar surface close to the wrist. This area was systematically examined for about three years after the operation. All forms of sensibility tended to return gradually from anesthesia through decreasing degrees of hypoesthesia to normal; warmth and cold, however, passed through an intermediate stage of hyperesthesia. There was also hyperalgesia, as measured by the intensity of the sensation and not by the threshold which was normal. The areas of sensory loss were about the same for all forms of sensibility, though the distribution of returning sensibility within the area itself was always patchy. An intermediate zone between the inner anesthetic area and the normal skin also appeared. The different forms of sensibility, except warmth which was very much delayed, returned to normal at about the same rate. Remote reference was frequently observed, and often a stimulus was perceived as double, localized correctly and remotely at the same time.

These results confirm those of Trotter and Davies in many important respects. Boring makes a thorough and careful analysis of Head's theory and formulates his objections to it under four chief heads. First, he objects on a priori grounds to Head's assumption of two systems of different phylogenetic age. This is not borne out by analogy with the evolution of the other senses. Sec-

ond, the theory, devised to account for a particular group of facts, is inadequate to account for all the facts of cutaneous sensibility, and cannot, therefore, replace the older hypotheses. Third, a great many features of the phenomena it was formulated to explain are left unaccounted for by the theory. For example, it assumes inhibition of one system by the other, yet gives very little indication of the nature of such inhibition. Fourth, it indicates a number of generalizations which are at best doubtful. For example, the characteristics and functions assigned by Head to one or another of the two supposed systems are often found to be dissociated.

Boring himself makes a theoretical proposal designed to extend the older theories of cutaneous sensibility to account for the new facts. He first outlines Bernstein's theory to account for the facts of two-point discrimination. It is a theory of central projection. When two points are close together their central effects overlap and summate, the result being the perception of a single stimulus somewhat more intense than either of those actually applied. When the points are more widely separated the central effects do not overlap, but they exercise an inhibition over each other. The conscious accompaniment of this is the perception of two separate stimuli each one less intense than is the case when it is applied alone. Boring's interpretation supposes that by the overlapping of sensory fibers of a single system each sensitive spot on the skin is supplied by more than one fiber, these fibers, however, playing rôles of unequal importance in carrying impulses to the central areas. The fibers which supply a given spot may come from the same nerve or they may come from different nerves. In the latter case when one nerve is severed only one of the spot's innervating fibers is thrown out of function. In case the most important one is cut the spot will be supplied only by a fiber or fibers of relatively low functional importance. The result will be anesthesia or hypoesthesia. But now the still intact fibers will gradually take on vicariously the functions of the inactive principal one, and, in the absence of the other's inhibiting influence, will give effects more intense than normal (hyperesthesia), until with the regeneration of the principal fiber the sensibility of the spot is returned to normal. During the period of vicarious function, however, the impulses from the spot are being carried to a central point different from that to which primary impulses from that spot normally go. Remote reference is the result. Hyperesthesia without remote reference is the case when the principal fiber is intact and giving effects which

are abnormally intense because of the absence of the inhibiting effect of a severed secondary fiber. In these and related ways all the peculiarities of the sensibility of skin areas supplied by regenerating nerves may be interpreted in terms of a single system of nerve-supply and inhibitory effects between its overlapping parts.

Boring's hypothesis has the advantage of being in accord with the older accounts of cutaneous innervation. It accounts in a simple way for the facts which have been added by experiments on nerve division without postulating new systems as does the Head theory. Moreover it brings the new phenomena into relation with the facts of two-point discrimination and of summation and inhibition of pressure sensations in a more significant way than does the Head theory. The latter, in the reviewer's opinion, cannot stand, in view of more recent experimental work and the theoretical considerations which have been urged against it. Boring's hypothesis seems adequate to the facts, and if it strikes one as a rather bare account it should be borne in mind that our knowledge of the anatomy and physiology of the sense-organs of the skin is still very meager. The results of von Frey and of Hacker, who found normal thresholds for all single spots in the affected areas, seem to present a difficulty. It may be that this is more apparent than real, and due simply to the different neurological conditions of the areas on which they worked. But at least it indicates the need of more knowledge of how single spots behave under all conditions. This does not imply a criticism of Boring's methods, which were adequate to his problem; it merely emphasizes his statement (p. 94) that "there still remain countless problems for the sense-physiologist who, with a still more refined technique, will undertake, one phase at a time, the problem of the sensibility of the skin after the division of a nerve."

Within the last year Pollock (17) has published the results of a study of over five hundred cases of injury to peripheral nerves. He finds conclusive evidence that the early return of pain sensibility to a skin area supplied by a severed nerve is due not to the regeneration of the nerve itself, but to the functioning of an adjacent nerve whose supply of fibers overlaps with that of the nerve affected. His conclusions are based chiefly upon the study of 132 cases in which examination of the sensibility of the affected areas was checked up with definite knowledge, obtained in operations, of the state of the affected nerves. The limits of loss of sensibility to light touch were determined with a wisp of cotton, the stimulation

of hairs being guarded against by shaving the area. The areas of pain sensibility were determined by the use of weighted needles sliding in a bit of glass tubing. Pain sensibility was found, existing or returning, in areas in which, as shown by the operations, it could not have been due to regeneration of the fibers of the nerve which normally supplies the region. Such sensibility occupied the borders of areas supplied by adjacent uninjured nerves; and when these adjacent nerves were later sectioned, it disappeared. When two nerves supplying adjacent areas were both severed, no pain sensibility remained on the borders where it was always found when either nerve was divided alone. Sometimes the regenerating nerve supplying the anesthetic but partly algesic area was resected. It was found that this resection did not result in the loss of pain sensibility, as should have been the case if the return of pain sensibility had been due to the regeneration of this nerve. The author suggests that the assumption of function by adjacent nerves explains Head's finding a dissociated return of pain sensibility. He admits that such sensibility, even accounted for in this way, might still be regarded as Head's "protopathic"; but he calls attention to the fact that one of Head's strongest arguments in favor of two systems of fibers is based upon temporal dissociation. This support at least his own results seem effectually to remove.

Of recent text-book accounts of cutaneous sensation some outline Head's theory with varying degrees of approval (**20**, **21**, **23**, **24**, **26**), others omit references to it altogether (**22**, **27**, **29**, **30**). One finds the terms "protopathic" and "epicritic," however, used even by writers who omit reference to the theory or who treat it with reserve (**25**, **29**). If these terms are used simply as convenient synonyms for subcutaneous and cutaneous sensibility, the only objection to their use would seem to be based on the law of parsimony. If, however, they still carry their original genetic connotation and imply the existence of two distinct forms of cutaneous sensibility, their use is open to the most serious objections which have been urged against the theory itself.

The results of work on areas supplied by defective or regenerating nerves give special interest to several investigations of the effect upon each other of pressure sensations aroused by simultaneously or successively applied stimuli. von Frey found that two pressures simultaneously applied resulted in mutually facilitating effects. Other investigators, however, had found a tendency for simultaneous pressures to inhibit each other. The question

gains added interest when it is later found by von Frey and by Hacker in the work already described that on skin areas with imperfect sensibility, although all single pressure spots may have normal thresholds, the stimulation of a number of them together results in intensification. Arps (2), in a study of the assimilative effect of one pressure stimulus upon another, found that the sensations aroused by a standard stimulus of constant intensity varied in intensity with the intensity of the comparative stimulus. Within certain limits the subjective intensity of the standard grew greater with increase in the intensity of the comparison stimulus. Schulte (7) made a careful quantitative study of the effect upon one (standard) pressure stimulus of another (inducing) stimulus applied either a certain length of time before the standard or simultaneously with it. A third (comparison) stimulus was used to measure the effect by being varied until it appeared equal to the standard. The effect of the inducing stimulus was found to be nearly always one of summation, and this effect was progressively greater with greater intensities of the inducing stimulus. The summation effect was greatest when the inducing stimulus was applied simultaneously with the standard, and it decreased as the temporal separation grew greater. The points of application of the stimuli remained constant. They were applied to the backs of the index and middle fingers of the subject's right hand. It would be interesting to have the same method applied to a study of the spatial as well as temporal conditions of this process of summation. It is possible that much of the disagreement on the effects of simultaneous pressure stimuli is due to the greater or less separation of the points to which they are applied.

In the field of the temperature sensations very definite advance has been made recently. The qualitative distinctness of the warmth and cold senses was fairly well established some time ago, but the qualitative difference between warmth and heat, although observed and described by several writers, has been definitely demonstrated only recently. As recently as 1912 Goldscheider (2) maintained that heat is simply a more intense form of warmth, and not, as Alrutz had contended, a fusion of warmth and cold sensations. Since then the hypothesis of Alrutz has been conclusively demonstrated, first by Alrutz himself (4), and later by Cutolo (7). Within the past year Alston (8) has published the results of a study of the spatial conditions of the fusion of warmth and cold in heat. Judged by published descriptions, the reviewer

considers the "grill" devised by Cutolo to be the simplest and most convincing method so far devised to demonstrate this fusion. The grill consists of a series of fine glass tubes laid side by side and close together. By means of rubber tubes fitted to the ends of the glass ones, warm water can be made to flow through the even-numbered tubes and cold water through the others. The subject places the palm of his hand upon the grill, and by experiencing the effect of either system separately and the combined effect of the two, can clearly perceive that heat is a fusion of warmth and cold. Cutolo made a more detailed study of heat with the Zimmermann thermesthesiometer. A warm spot and a cold spot from 2 to 9.3 mm. apart were stimulated simultaneously, each with its appropriate temperature stimulus. The resulting experience was found to be very complex, but heat was reported in the majority of observations. Alston extends this study by making a special analysis of the spatial conditions of the fusion. His three subjects had all had considerable experience in introspection. The apparatus and methods used are similar to those of Cutolo's study. It is found that the percentage of cases in which warmth and cold fuse into heat becomes less as the distance between the spots stimulated becomes greater. However, the fusion may take place when the spots stimulated are as much as 10 to 15 cm. apart, a separation over three times as great as the two-point threshold for the region investigated. The quality of heat is often experienced in addition to that of cold or that of warmth. Most often it followed an introductory experience of cold. This is what one would expect in view of results of experiments on reaction-times for temperature stimuli.

In connection with the results of Alston's study of heat the work of Ponzo (3) and of Dimmick (5) on the localization of temperature sensations is interesting. Both of these investigators used radiant forms of stimulation to do away with the effect of arousing concomitant sensations of pressure. Dimmick worked on warmth alone and found that its localization as compared with that of pressure was poor. Ponzo found warmth localization poor and cold localization only slightly better. These results on localization offer a suggestive parallel to Alston's result, and indicate at least a partial explanation of the fusion of a warmth sensation and a cold into a unitary experience of heat when the stimuli arousing the sensations are separated by more than three times the distance of the two-point threshold.

The effect of the area of the stimulus upon the cold sensations aroused has been studied by Siebrand (1) and by Barnholt and Bentley (1). The former found that the difference threshold for temperature was increased when the area of the stimulus was increased ; or when, without change of area, it was applied so that it affected a greater number of cold spots. Increase of area increased the difference threshold even when the stimulus affected only one cold spot. Barnholt and Bentley are concerned with the effect of the spatial extent of the stimulus upon the intensity of the cold sensations aroused. They find, other things being equal, that the more extended the area the more intense is the sensation aroused. However, it is found that if a stimulus of smaller area is applied to a surface of greater sensitivity the intensity of the sensation is the same as for that aroused by a larger stimulus applied to a less sensitive area. This result again recalls those subsequently obtained by von Frey and by Hacker when they found that greater intensity of sensation resulted when the stimulus covered more than a single sensitive spot.

The most thoroughgoing introspective study of any single cutaneous quality which has appeared recently was made by Becher (5) on the pain sense. His purpose was to determine whether pain stimuli arouse sensations of different quality when applied to different regions. He acted himself as subject and had the whole surface of his body explored with various sorts of pain stimuli. Everywhere on the white skin he finds the quality of the sensation of superficial pain the same. On certain parts of the body, however, sensations of different quality were aroused. This was particularly true of the interior of the auditory canal. The author devotes considerable space to the consideration of the difficulties attending an introspective investigation of this sort. Pain, when it becomes intense interferes with accurate introspection, so that the relation between quality and greater intensity is very difficult if not impossible to study.

*Pain*, by R. J. Behan (9), first published in 1914, has appeared in a second edition during the past year. The book is intended for the clinician, and pain as symptom is the point of view maintained throughout. Some of the neurological descriptions and charts may be of value to psychologists, but as far as the study of cutaneous pain sensation is concerned the book is of little use. The author's psychological horizon is perhaps fairly indicated by his treatment of consciousness. He writes (p. 15): "Since we speak

of consciousness it may be well to briefly consider it. It has been defined as the ability, power, faculty, or mental state of being aware of one's own existence, thoughts, feelings, actions and sensations, whether intellectual, moral or physical (Sudduth, 472),[1] and must be present to take up and correlate the different stimuli reaching the brain from the periphery."

Little experimental work has been done on sensations of tickle and itch, and in general they are given little prominence if they are mentioned at all in text-book accounts of cutaneous qualities. Thöle (2) finds that after injection of cocain and stovain into the cord tickle and itch disappear as sensory qualities just before touch and pain respectively, and return just after them. He concludes that tickle is due to partial arousal of the touch mechanism and that itch bears a similar relation to pain. This is in harmony with other views. Basler (2) studies the relation between the weight of a stimulus drawn across the skin and the intensity of the sensation of tickle aroused. He finds that there is a certain range of weight within which stimuli arouse maximum tickle sensations. If the stimulus is further increased the sensations of tickle decrease until finally only pressure sensations remain. This study also supports the conclusion that tickle is due to a partial arousal of the touch mechanism.

Within the last year Titchener (18) has published descriptions of four frame models for the demonstration of sensory qualities. One of these is a pyramid to indicate the relationships between the various touch qualities as the color double-pyramid indicates those between the various visual qualities. The touch model is illustrated. Several determinations of touch qualities are admittedly tentative, and the author confesses that warmth and cold baffle him completely in the attempt to bring them into qualitative relation with the terms of the figure. But this, he thinks, cannot discredit the figure, still less the plan.

Studies of after-sensations have been made by Hayes (2), by Dimmick (6), and during the last year by Holland (16). Hayes studied after-sensations of all sorts, Dimmick and Holland have confined their investigations to those of pressure. After-sensations are found to occur with considerable regularity. The sensation may persist after the stimulus has been removed. This is called a primary after-sensation. Then the sensation may reappear

[1] The reference is to an article by W. X. Sudduth, "A Study in the Psychophysics of Pain," *Chicago Med. Recorder*, 1897, 13, 329–337.

after an interval during which there is no sensation. This is called a secondary after-sensation, and it may recur more than once. The secondary after-sensation is called an after-image by some writers. One of the chief difficulties in earlier work in this field seems to have been that the stimuli used aroused the subcutaneous as well as the cutaneous organs to activity, the result being two after-sensations. Dimmick, therefore, and Holland, in their work on after-sensations of pressure, used stimuli known to be below the threshold for subcutaneous pressure. Dimmick had only two subjects and found rather wide individual differences. Holland repeats the work with more subjects and finds clear evidence that individual differences are due to the attitude of the subject which results from his understanding of the instructions. When this attitude became the same on the part of all subjects wide individual differences disappeared.

There have been comparatively few studies of adaptation in recent years. Rubin (2) reported the results of some experiments on temperature sensations which lent support to the Weber theory. As is well known, this theory meets its greatest difficulty in accounting for long continued experiences of warmth or cold. Rubin had his subject bare his arm in a cold room. A thermometer was fastened to the skin, and readings were taken during periods lasting from 40 to 60 minutes. It was found that the thermometer registered a decrease in temperature during all that time. Moreover, the periods during which the subject reported the most intense sensations of cold corresponded to those during which there was the greatest drop in temperature. This can hardly be taken as removing the objection to the Weber theory mentioned above. Long-continued experiences of heat in fever still present a difficulty. Abbott (4) made a thorough study of the effect of adaptation upon the temperature difference threshold. The chief result of this study is the discovery that there is a certain point on the thermometric scale at which stimuli are accurately judged regardless of the condition of adaptation of the skin to which they are applied. This point is 32.5° C., which is very close to what has been estimated to be normal skin temperature. The author finds both the Weber theory and the Hering theory inadequate. The conception of a "physiological zero" which shifts up or down with adaptation to warmth or cold is incompatible with the facts brought out by the experiments. If the current conception of the physiological zero were the case, then when adaptation had taken place say to cold, and

the physiological zero had shifted down, we should expect to find the finest difference sensitivity to cold stimuli at physiological zero temperature. But the results of the experiments show that this is not the case, and that stimuli at 32.5° C., or normal skin temperature, are still those most accurately judged. The author makes the interesting suggestion that normal skin temperature may persist as a constant standard of comparison in every experience of cold or warmth. Strauss and Uhlmann (7) experiment on adaptation to superficial pain. They find, in contrast to some earlier views, but in harmony with what one would expect from analogy with the other senses, that adaptation to superficial pain occurs with great regularity. The absolute time required varied considerably between the two observers, but with each it increased progressively with increase in the intensity of the stimulus.

Before leaving the field of cutaneous sensation the so-called "sensation of vibration" should be briefly considered. The term designates the experience which results when the foot of a vibrating tuning-fork is placed in contact with the skin. The experience is especially clear when the point of contact is over a bony prominence. The method of arousing it has been used rather extensively by neurologists as a diagnostic test. Recent papers on its use in this way have appeared by Symns (7) and by Williamson (7). von Frey (5) made an analytical study of the experience, his chief purpose being to determine what sense-organs mediate it. He finds that if the vibrating stimulus is made so fine that it affects only one sensitive spot on the skin, the pressure spots are the only ones which will mediate discontinuous impulses as discontinuous when they come at the rate of 60 to 100 per second. Temperature and pain spots respond with a continuous, fading sensation. When the stimulating vibrator is placed in contact with a bony prominence, the effect is intensified. von Frey believes that this is due to the spread of the effect to a greater number of pressure end-organs. The question of whether sensory endings in the subcutaneous structures may mediate the sensations von Frey thinks may be answered in the negative, for when these structures are stimulated intermittently by the faradic current the only result is dull pain. In connection with work on the "sensation of vibration" an investigation made by Basler (3) is of interest. By means of an apparatus to which he gives the name "thermische Reizmühle," this experimenter determines the rate of succession at which warmth and cold stimuli cease to be perceived as discrete and fuse into a single, continuous

experience. As compared with the sense of pressure, the senses of cold and warmth are found to be relatively poor in their ability to give discrete sensations at a quick rate of succession. The cold sense is somewhat superior to the warm in this respect.

Work on sensations from muscles, tendons, and joints, through the earlier part of the period covered by this review, followed old lines. The most frequently employed procedure was to arrange a member, usually an arm, in such a way that its movements, active or passive, could be accurately measured. In this way determinations were made of the least perceptible movement and of difference sensitivity for active or passive movement under different conditions. The conditions were varied by changing the degree of flexion or extension of the member, the resistance against which it had to move, its rate of movement, or by anesthetizing one part or another. Toward the close of the decade Lashley (7) published the results of an experimental study of the accuracy of movement in a pathological case which, in the reviewer's opinion, is of great importance for work in this field. The systematic significance of kinesthesia has been variously emphasized. In the recent literature it has been suggested as a basis for theories of the will by G. V. N. Dearborn (3) and by Wheeler (19).

Employing methods of the kind indicated above, Störring (2) found a threshold for horizontal movement about the elbow joint of 1/200 of a degree. Previously the threshold of 1/2 degree found by Goldscheider had been the smallest. Störring attributes his so much smaller result to the fact that in his own experiments pressure sensations were not eliminated. Erismann (2) takes the difference threshold as a measure of the effect upon kinesthetic sensations of varying conditions. The difference sensitivity for active and for passive movements he finds to be about the same; if anything there is slightly greater sensitivity in the case of active movements. The influence of rate of movement is found to be very slight; if anything it has a slightly greater effect in the case of passive than in the case of active movements. With active movement he finds that making the movement against resistance results in disturbance of judgment, the result of which is underestimation of the extent of movement. Winter (2) attacked the problem of whether movement sensations come from the muscles and tendons or from the joints. He concluded in favor of the muscles and tendons for two chief reasons: first, because the angle at which the arm was held had considerable effect upon the difference

sensitivity, and this is a condition which greatly affects muscle shape and little affects joint action; second, because anesthetization with ether and the electric current had little effect upon difference sensitivity when the agent was applied to the joint, and a much greater effect when it was applied to the muscle.

von Frey (4) favors the view that the sensory factors upon which the judgment of weight depends are connected with the muscles and tendons and not with the joints. This investigator made a new departure in lifted weight experimentation. He used a long plaster cast, covered with leather, fitting the subject's arm from shoulder to wrist and holding it rigidly extended. When the arm in the cast is held at right angles to the body, weights may be hung upon it at different distances from the shoulder. In this way pressure sensations are eliminated, and it is possible to calculate the exact force which the weight exerts about the shoulder joint. von Frey has stressed the importance of subjecting the method of lifting weights to rigid control. The same weight lifted in different ways may involve the expenditure of different amounts of muscular force. The significant thing from a psychological point of view is not the magnitude of the weight, but the magnitude of the muscle strain required to raise it. By the method described, von Frey made an investigation of the difference sensitivity for lifted weights. He found it to be very fine, approaching even the fineness of that for visual intensities. A further study by von Frey (5) also emphasizes the need of a perfectly constant method of lifting in experimentation of this sort. This study was made to test the common observation that tossing a weight in the hand is preferred as a method of estimating it to merely raising it. von Frey's results bear out the common observation, showing clearly that tossing the weight does result in greater accuracy of judgment.

During the past year Fernberger (12) has described a set of weights designed to meet the requirements of non-variability in weight and temperature. He calls attention to the fact that although the need of eliminating temperature sensations has long been generally recognized in esthesiometric work, it has rather escaped notice in lifted weight experimentation. He outlines the advantages of hard rubber as a substance for making the bodies of weights. It varies less than wood with changes in atmospheric conditions, and successfully eliminates the factor of temperature stimulation which is nearly always present when metal weights are used.

An article by Friedländer (13) on the perception of weights treats the pressure and kinesthetic sensations involved only as incidental to the main problem of perception. The experiment, described are directed toward an analysis of the process of objectification. Weight, like color, is experienced as a quality of the object. The groundwork of sensation, the rôle of attention, and various other factors in this objectification are introspectively examined under different conditions.

Lashley's article (7), which appeared in 1917, is the report of a study made upon an intelligent young man whose left leg, as the result of an injury to the spinal cord, was almost totally anesthetic. Tests showed that he was quite unable to judge passive movements of the member; in fact, without the aid of vision, he could not tell that his leg had been moved at all. One test involved his holding his leg extended in a horizontal position. The leg would be held in this way for a short time, then it would flex and the foot would drop without the subject's being aware that it had changed its position. Other tests in which the extents were measured which the subject judged to be equal when the leg moved against varying degrees of resistance showed that in active movement too there were no excitations from the moving limb which were specific enough to give a clue to the extent of the movement. The accuracy with which the subject was able to move his anesthetic limb was then tested. Without, of course, the aid of vision, he was required to approximate prescribed extents with movements of the anesthetic member. It was found that his ability to do this was not significantly less than that of a perfectly normal subject, and the results show clearly that the estimate of the extent is not based upon the length of time required to accomplish it. The author thinks it probable that the nervous discharge to a muscle may be regulated after its initiation without there being any afferent impulses from the effector activated.

These results are highly important in several ways. In the first place they add a telling argument to those which have already been arrayed against the so-called "sensation of innervation." But they are significant also for studies of the afferent impulses originated by muscular contraction. Such studies have often taken the characteristics of active movement as indicative of the characteristics of the sensory processes involved. Lashley's work would seem to show that there is no necessary relation between them, and that what is really measured may be rather the factor

of central control. There has been, perhaps, a tendency to overemphasize the part played by kinesthetic sensations in the control of movement. Pillsbury says (27, p. 340): "In addition to these impressions from the higher senses, sensations from the moving member serve to control all movement. The best evidence of this statement is the fact that when kinesthetic sensations are lacking, control is inadequate." Other writers assign to kinesthetic sensation rôles of comparable significance in the control of movement. Some, however, regard the "resident sensations" as less indispensable. Angell, for example (20, p. 402), says: "The ideas and sensations by means of which we supervise our movements may be of the most various character, and their relations to the movements may be either very close, as in the case where they are kinesthetic, or indefinitely remote." The work described above shifts the emphasis from periphery to center, from present sense data to the results of past experience. Kinesthetic sensations are, no doubt, of great importance when a movement is being learned, but when control has once been established their importance seems to be less. This whole matter is significantly related to problems of the will, since, as noted above, the kinesthetic sensation is taken by some writers as the basis of the will-experience; but into the intricacies of this subject the present review will not venture.

The study of the effects of stimulating the semicircular canals, utricle, and saccule is generally regarded as a branch of the study of kinesthetic sensation. There is no doubt that these organs are true receptors and that their stimulation gives rise to reactions which may be of considerable importance in the life of the organism. Also, since these receptors are normally stimulated by change of position or movement, they may properly be classed as kinesthetic. Most writers group the functions of the semicircular canals, utricle, and saccule together as a single sense, designated as "static" (20, 23, 26, 27, 29), as "labyrinthine" (25) or "labyrinthic" (24), or as the "equilibrium sense" (30). Titchener (28) distinguishes two senses here, the "ampullar" and the "vestibular." Writers are fairly well agreed that sense qualities aroused by stimulation of the kinesthetic sense organs of the inner ear are very vague and undifferentiated. Some incline to the view that stimulation does not give rise to conscious qualities at all (20, 22, 26), and that the activity of the receptors is experienced only through its after-effects.

The chief methods of stimulating the organs of the static sense are by rotating or otherwise moving the whole body in space,

warming or cooling the sense organs, or passing an electric current through the head. The various methods of stimulation are described in detail in *Equilibrium and Vertigo*, by I. H. Jones (7). The effects of stimulation are found in bodily reactions of various sorts: nystagmus, change in the tonus of muscles, compensatory reflexes, organic responses, and so on. These reactions are usually accompanied by complex experiences of dizziness and sometimes of nausea.

The effects of one-sided labyrinth extirpation upon the tonus of the muscles of the body have been made the object of thorough study by Magnus and de Kleijn (3). These experimenters used four kinds of animals (rabbits, guinea-pigs, cats, and dogs). They found that labyrinth tonus exists without a doubt, but that it is developed in different degrees in different animals. Within the last year these experimenters (10) have published the results of further extirpation experiments on cats and rabbits. They conclude that labyrinth reflexes in these animals have their central seat not in the cerebellum, but in the medulla and mid-brain. The work was done on animals which had already been decerebrated. After connections with the cerebellum had been severed it was found that the labyrinth reflexes still persisted. Careful anatomical examinations were later made of the central structures of the animals experimented on as a control over the success of the operation in completely cutting off connection with the cerebellum. This work is very important, as hitherto most writers have regarded the cerebellum as the central seat of static reflexes. The second article of de Kleijn and Magnus (11) is a thorough study of the tonic reflexes of the eye muscles of the rabbit. Conditions of one-sided and double labyrinth extirpation are brought about in the analysis.

Prince (7) has recently made a study for the purpose of observing the development of the functions of the labyrinth in very young animals. He experiments on the effect of rotation and one-sided labyrinth extirpation in very young kittens ranging in age from six days to seven weeks. He finds that their reactions show progressive changes with increasing age. Well defined labyrinth disturbance was not found until about the third week after birth.

Mann (2) has studied the effect of electrical stimulation of the labyrinth upon bodily tonus in man. A galvanic current was passed through the head from ear to ear. Under conditions of

stimulation of this sort it is found that the functions usually attributed to the labyrinth are augmented on the cathode side and decreased on the anode side. With relatively weak currents, too weak to produce the nystagmus or incoördination of bodily movements which result from the use of stronger ones, a change in the tonus of bodily muscles is found to appear. This does not show itself in an outwardly apparent relaxation on one side of the body and contraction on the other; but if two equal weights are held, one in one hand and the other in the other, they appear unequal. This, the author thinks, is due to increased tonus on one side and decreased tonus on the other. An application of the technique of lifted weight experiments to a quantitative study of this phenomenon might yield valuable results.

Burtt (7) made a study of the perception of slight changes of equilibrium, the purpose of which was primarily to contribute to the solution of certain problems of aviation. He found that lateral changes were in general more readily perceived than longitudinal ones. With the apparatus used in this study it was also possible to measure the relative effectiveness with which such changes of equilibrium were reacted to with different forms of airplane control.

During the past year two articles by Griffith (14, 15) give the results of a systematic study of the bodily and mental effects of repeated bodily rotation. The subjects, of whom there were sixteen, were rotated a great number of times during a period extending over some months. The bodily and mental effects were observed as they underwent change with repeated experiments. Each subject was given ten trials during an experimental period, five to the right and five to the left, each trial consisting of ten revolutions. The ocular resultants of rotation were made the object of quantitative study by measurements of the duration of apparent movement of objects in the visual field, the number of eye-movements, and the duration of after-nystagmus. It is found that with repeated rotation the after-effects decrease markedly, at first rapidly, then progressively more slowly. The decrease holds not only of the series as a whole, but appears also between the first and last trials of a single day. Other after-effects of rotation are found to follow the same decreasing course as the ocular resultants. A careful analysis is made of the effect of various physical and temporal conditions, and of that of the general organic state of the subject. It is also found that the organic effects of practice obtained under one set of conditions may be carried over

to other sets of conditions. If practice is kept up long enough the organic effects of rotation may entirely disappear. On the subjective side it is found that the experiences resulting from rotation are very complex, but nowhere is there found a process which could be called a "sensation of rotation" or a "sensation of movement." It is found that certain mental factors such as attention, psychophysical determination, and mode of visual fixation have an effect upon the results of rotation, both organic and mental.

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# SOCIAL PSYCHOLOGY AND THE SOCIAL SCIENCES

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The year 1920 was exceedingly prolific in works in social psychology and in sociology. Possibly the war has aided somewhat in stimulating attention to these subjects. Social psychology in particular has come to receive so much attention that it is difficult to review even the chief contributions to it during the year.

Early in 1920 Professor Knight Dunlap in his presidential address before the Southern Society for Philosophy and Psychology (7) bewailed the non-existence of a scientific social psychology, apparently consigning to the scrap heap all that had previously been done by workers in that field. "Where, we ask, is our social psychology? And the answer is that it is yet in the making, and that it is being made not by psychologists, but by politicians, and by indepen lent thinkers like Bertrand Russell and Bernard Shaw." Evidently in Professor Dunlap's opinion Cooley, Ross, Giddings, and possibly McDougall are not as deserving of mention as Bertrand Russell and Bernard Shaw. Yet he concludes optimistically that we can have "a real social psychology" if we will proceed upon the basis of *empiricism* and avoid such delusions as the metaphysical debate between "interactionism" and "psychophysical parallelism." Very sensibly, too, he says: "That which is needed is a social psychology: not physiology. We need to deal with the desires, with the purposes, the emotions, and the conscious tendencies of men and women, and we need to deal with them as they are."

As if in answer to Professor Dunlap's lament a number of texts in social psychology appeared in 1920, each attempting to outline at least a scientific approach to the subject. The most ambitious of these attempts is that of Professor James Mickel Williams (16). He tells us in the preface of his work that it is but the first volume of a six volume treatise on the whole field of social psychology. This first volume is merely introductory to the whole treatise and discusses chiefly the relation of social psychology to the other social sciences. The second volume will deal with the field of literature and art; the third with that of the conflict of interests

in social relations; the fourth with that of the adjustment of interests; the fifth with the control of personality; and the sixth with the processes of social control. If the scheme is carried out the work will be almost monumental. Professor Williams informs us that these six books are already written. Social psychologists and sociologists will eagerly await their publication.

It seems rash to attempt to criticize a work of which we have as yet only the first installment, and the author warns against so doing. Nevertheless some judgment may be tentatively offered on the basis of this first volume. Professor Williams defines social psychology as "the science of the motives of the behavior of men living in social relations." Social psychology, he tells us, does not cover the entire field of social relations, but merely the *motives* of social behavior. "By a motive," he says, "is meant any mental state which either assists or hinders an act." The motives of which he apparently intends to make the most use, however, "the essential assumptions of social psychology," are certain instinctive dispositions—such as acquisition, rivalry, domination, submission, sympathy. These are the elementary processes of social relations, and the author tells us that "these dispositions will be used as assumptions in the analysis of the psychological aspect of the assumptions of the social sciences." In later volumes he proposes to analyze these assumed dispositions and thus reduce them to their lowest terms.

In the present volume he takes up in particular the relations of social psychology to political science, to jurisprudence, to economics, to history, and to sociology, with two concluding chapters on the field and methods of social psychology. Very rightly he says that each of the social sciences is built up on certain fundamental psychological assumptions. Each social science he regards in a large sense as psychological, but the social sciences proper, he holds, are objective in their treatment, while social psychology is the subjective basis for all of them.

As to the relations between social psychology and sociology, Professor Williams holds that sociology concerns itself with social behavior in its external aspects. He accepts Dr. W. I. Thomas' contention that sociology is a theory of social organization, and is thus a special science of culture, like economics, and is in so far opposed to social psychology as the general science of the subjective side of culture. This is true even of psychological sociology, according to Professor Williams, who says that psychological

sociology can mean nothing except a sociology which uses psychological assumptions. Nevertheless, no social process is thoroughly understood without psychological analysis and especially without analysis of the motivation of human behavior. Accordingly social psychology is necessary for sociology, but not a part of it. On the contrary, it is to be sharply distinguished from all sections of sociology and also of social philosophy.

It cannot matter much by what name any body of scientific knowledge is known, provided it is scientific; but it may be doubted whether any sharp distinction between social psychology and the social sciences, especially sociology, can be carried through as Professor Williams argues for. Most American sociologists, at any rate, concern themselves chiefly with the motivation of social occurrences, such as the formation of groups, the changes in institutions, the persistence of groups and their customs, and the like; and they use, furthermore, the very methods of investigation which Professor Williams approves. Professor Giddings, for example, a former teacher of Professor Williams, in two valuable articles on "Pluralistic Behavior" (10) does not hesitate to call sociology "the psychology of society." This may be a somewhat narrow conception of sociology, but it surely more accurately describes the scientific sociology which we find today than does Professor Williams's characterization. Moreover, what will our author do with such a man as Professor Cooley, whose work in social psychology and sociology, as I have said elsewhere, deserves, in some ways, to be ranked with the work of Darwin in biology? Yet Professor Cooley's work owes its scientific character to the accuracy of his psychological analysis of the motivation of social behavior. It is noteworthy that Professor Williams cites Cooley only once in his entire book, and then in a brief reference to Cooley's *Human Nature and the Social Order*. Cooley's *Social Organization* and *Social Process* are nowhere mentioned, not even in the bibliography, though they are his most important works. Is it possible that Professor Williams has overlooked some of the most notable works in psychological sociology, in spite of his very evident erudition? The works of Professor Hobhouse are also not mentioned.

It would seem, despite the author's argument to the contrary, that there is still good ground for clinging to the common sense view that "psychological sociology" and at least that section of social psychology which we call "collective" or "group psychology," are identical. It would follow that social psychology, so far as

it concerns itself with groups, is a part of sociology in any practical division of scientific labor, whereas, so far as it concerns itself with individual behavior, it is equally obviously a part of psychology. This is, at any rate, the condition which the literature of the two sciences seems at present to reflect; and there is nothing necessarily illogical about a science which is really a part of two other general sciences.[1] If this is the fact, we should expect to find both psychologists and sociologists engaged in developing social psychology, and this is exactly what we do find.[2]

While Professor McDougall in his new book (13), which we review elsewhere, holds that group behavior is the subject-matter of collective psychology, Professor Giddings in the articles just referred to (10) holds that pluralistic behavior, or the behavior of groups, is "the subject-matter of sociology," and that the approach to a scientific interpretation of such behavior must be through like-mindedness, that is, like responses, whether instinctive, habistic, or rational, on the part of the individuals of the group, to the same stimuli. Professor Bogardus (3), on the other hand, though writing as a sociologist, holds that the field of social psychology is distinct both from that of sociology and from that of psychology. His text, however, fails to show that this is the case, if we accept the dictum that the field of a science is determined by its problems; for the problems of which Professor Bogardus makes social psychology treat, are chiefly those of the interaction of minds, of social conflicts and change, and of social control and progress. These again are surely the problems with which the sociologist concerns himself. Professor Bogardus' book, regarded as a text, has the advantage that it approaches the subject through the problem-solving method of study; but its weakness is that it approaches its problems too largely from the side of suggestion and imitation, thus following Ross and Tarde rather than Cooley.

Perhaps the nearest approach to a satisfactory text in social psychology, especially on the strictly psychological and individual side, is Dr. Irwin Edman's *Human Traits and Their Social Significance* (8). This, we are told, was written for use in a course entitled "Introduction to Contemporary Civilization," required of all freshmen in Columbia University. It is a good presentation of the psychology of Professors Thorndike and Woodworth in its

[1] Compare physiological psychology, for example.

[2] It is noteworthy that Dr. Charles A. Beard in a letter commending this book of Professor Williams speaks of him as a "sociologist."

social implications. Perhaps rightly, considering that it was written as a text for freshmen, it contains no discussion of the relations of the sciences, but takes up successively the various types of human behavior, such as instinct, habit, and emotion, the social nature of man, the development of the self, and individual differences. However, part two, entitled "The Career of Reason," undertakes to apply psychology to the interpretation of cultural complexes, such as religion, art, science, and morals. This latter part of the book is least satisfactory, partly because anthropological, historical, and strictly sociological data have not been as carefully considered as the psychological. As a general survey of the processes of human nature, as they reveal themselves in social life, the book is worthy of commendation, though there is little original about it.

A book of a very different type is Professor Patrick's *Psychology of Social Reconstruction* (14); a more appropriate title of this book might have been, as he tells us, "Preliminary Notes on the Application of Psychology to the Problem of Social Reconstruction as Represented in Certain Popular Movements of the Day." Very rightly he holds that programs of social reconstruction should be tested by psychology; but as he lays much stress upon the instincts and the original inherited traits of man, his attitude toward social progress and the possibilities of social reconstruction through science and education is somewhat negative. He seems to hold that not only is there a constant tendency to revert to the instinctive level in social life, but that this tendency cannot be overcome through rational social control. He seems to agree with Kidd that some new interpretation of religion is probably about the only thing which will "snatch us out of our devotion to self and our narrow class interests." However, Professor Patrick does find some help in education and the organization of intelligence, and he is undoubtedly right in his contention that emotional, as well as rational control, is needed for social progress. The book is stimulating, but like many books written from the purely psychological point of view, it lacks a sufficient background in anthropology, history, and the concrete study of social conditions.

The sociologists, too, are at sea as regards the relation of their work to psychology and to social psychology. Perhaps these things have no place in elementary texts on sociology and social problems. That, apparently, is what Professor Binder (1) thinks, though Professor Dow (6) is of the opposite view. Professor Binder goes so far in the non-psychological direction that he undertakes

(2) to formulate a new theory of social progress without reference to any troublesome social psychology, namely, that progress is due to the amount of surplus vitality, or health, which a nation possesses. Professor Dealey (5), on the other hand, finds a large place for psychology and social psychology in sociology. He does not clearly state whether he regards social psychology as a part of sociology or not, but apparently he does, as he devotes several of the basic chapters of his book to social psychology. The book is an enlargement and revision of the author's *Sociology*, which was published in 1909, and is intended as an elementery text-book for college purposes.

The most notable text in sociology published during the year 1920, however, is Professor Ross' 700 page work on *The Principles of Sociology* (15). It is well worthy of the attention of social psychologists, not that any parade is made of the use of psychology, for neither the word psychology nor social psychology occurs in the index of the work, but psychological method and analysis are more or less in evidence in every chapter. While no formal psychological doctrines are appealed to, yet there is constant use of psychological principles, usually a sound and careful use. It is notable that Professor Ross has almost completely discarded, in this latest work of his, the use of suggestion and imitation as principles of social interpretation. Indeed, these words also do not occur in his index; and he refers but once to Tarde, and then only in the way of a quotation from Tarde's *Social Logic* as to the effect of festivals on unifying human groups. One cannot but ask whether Professor Ross, who made so much use of Tarde's suggestion-imitation principle in his *Social Psychology*, published in 1908, has outgrown his former views, or whether he merely means that he would consign the suggestion-imitation explanation of social processes to the limbo of social psychology.

Professor Eliot is another sociologist who would apparently make psychology fundamental in sociological interpretation. Of the numerous articles in periodical literature along social psychological lines which appeared during 1920 his paper (9) is especially worthy of attention, because it indicates a way of harmonizing and combining psychological methods with the objective methods of the social survey in the study of social conditions. Whether one criticizes the details of his exposition or not, one is forced to conclude that some such synthesis of subjective and objective methods will characterize more and more the social research of the future.

This conclusion would, of course, not be agreed to by Dr. Lowie who, in his latest study of *Primitive Society* (12), again condemns all psychological interpretation of culture, and rigidly confines himself to a description of the objective aspects of primitive society in the family, the sib, voluntary associations, rank, government, and justice. He is practically forced, therefore, to say nothing about primitive beliefs, primitive religion, and primitive art. This he does, though to the reviewer, a description of primitive society with these things left out seems entirely unsatisfactory, even from a strictly scientific standpoint. Mr. James, on the other hand, in an elementary text on the same subject (11), devotes a considerable part of his book to these subjects. Verily, psychology divides both the anthropologists and the sociologists, even perhaps as sociology may be said to divide the psychologists!

A book which may help possibly in bringing some order into these badly tangled relations in the social sciences is Professor Conklin's latest work (4). Avowedly a popular work, and written strictly from the standpoint of a biologist, the work in its way surveys the whole field of the social sciences. It discusses not only the biological foundations of society, but also the biological bases of democracy, ethics, and religion. It is noteworthy that this biologist finds plenty of room in his scheme of life for the subjective and the psychic, yes, even the "teleological," though this will doubtless make his book anathema to mechanistic determinists. Like most social psychologists, he finds that human society is founded on human instincts, and that in most men instinct is more universal and more powerful than reasoning. However, intelligence and freedom have come in human society to interfere with instinct, and this is the explanation of the incompleteness of its integration, co-operation, and harmony. Moreover, as intelligence rises the proportional strength and power of instinct decreases in controlling the relationships of men. The well-balanced view of the whole social life process which Professor Conklin presents might well be emulated by all workers in social psychology and in the social sciences.

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## SPECIAL REVIEWS

*Mind Energy.* Henri Bergson. (Trans. by H. Wildon Carr.) New York: Holt, 1920. Pp. 225.

The lectures and essays which form the content of M. Bergson's latest book have been delivered or published at different times and places from 1901 to 1913. They show clearly his characteristic philosophical attitude, and his empirical method in dealing with philosophical problems, here applied to an important general problem of psychology. In this rather small volume he is less intimately concerned with the nature of "mind energy" than with the nature of the relationship which exists between mind and brain. Most of the lectures and essays are concerned with different phases of this problem. While certain conclusions reached by following various lines of facts are indicated, no attempt is made to formulate a precise theory.

M. Bergson considers that all the usual theories of equivalence between mind action and brain action, monism, parallelism, epiphenomenalism, etc., are ultimately derived from the work of Descartes and his successors. This philosophy itself arose as a result of the applications of mathematics to physics and astronomy in the early days of modern science. For lack of anything better, not only the physical sciences, but also biology and psychology are built upon the metaphysical foundations of this type of philosophy. Since these foundations were fashioned to support only those sciences which deal with the entities to which the mathematics of space may be applied, the result is that the edifice of the life sciences appears very much awry, and that of the mental sciences in an even worse condition.

Present-day psychologists have allowed themselves to become hide-bound by the Cartesian tradition instead of following the facts until led to discover a set of fundamental principles more proper to their science. On account of this, our intellectual laziness, and the dullness of our philosophical wits, we are condemned to suffer a host of misbegotten theories ranging from monism to certain types of behaviorism.

In dealing with his main problem M. Bergson breaks away from the *a priori* methods habitually followed by most psychologists in discoursing upon the problem of mind and matter, and follows up certain lines of facts. These converging lines of evidence lead him to the conclusion that mental processes and neural processes do not stand in a one to one relationship to each other. Even if we had a complete knowledge of all the processes among the atoms and molecules of the brain, and knew their psychical correlates of the moment, this would not enable us to tell all that was going on in the mind at that moment, because a vast part of mental life goes on independently of the brain. One could "read" from a complete knowledge of brain processes only that relatively small portion of mental activity which immediately has to do with the choice and action of the moment, with the insertion of the mind in the physical universe. Facts in support of this thesis, and such evidence as is afforded regarding the nature of *l'energie spirituelle*, are drawn from a consideration of such subjects as "Life and Consciousness," "The Soul and the Body," "Phantasms of the Living," "Dreams," "False Recognition," "Intellectual Effort," and "Brain and Thought."

The function of the brain as connected with the mind is, as M. Bergson has stated in his other books, to inhibit mental activity, screening off all except such portion of it as may be useful from the point of view of the choice and action of the moment. Occasionally this screen falls, the inhibitory mechanism lapses in its functioning, and in dreams, in cases of false recognition, in the various phenomena of trance, and in certain other mental states, we are enabled to discern portions of that abundance of mental life which goes on in addition to that portion connected with the working of the brain.

In the last essay "Brain and Thought," the position is taken that theories of equivalence, besides being untrue to the facts, are further vitiated by a logical error, into which their supporters inevitably fall. Either the notation of idealism, or that of realism, or both may be employed. But whatever is employed must be employed consistently, and the two notations kept separate from one another. This, M. Bergson finds, the supporters of theories of equivalence are unable to do, but they surreptitiously interchange one for the other to avoid the contradictions which inevitably threaten, when one is on the verge of success in applying any theory of equivalence to the problem of brain and mind.

The material of the book is not all new, and with certain brilliant exceptions, M. Bergson has expressed similar ideas in former books, but its value as a criticism of most of the usual attempts to define the relationship of mind to brain is decided. And it will probably be welcomed by those psychologists who may prefer to follow "lines of facts" in such matters, rather than *a priori* methods based upon somewhat threadbare and partially inapplicable metaphysical doctrines.

FOSTER P. BOSWELL

*General Psychology*. WALTER S. HUNTER. Chicago: University of Chicago, 1919. Pp. xiii + 351.

The writing of elementary text-books of psychology appears still in the experimental stage. Variation in the presentation of material occurs long after the science has settled down systematically, as witness mathematics, but in psychology we have not yet eliminated many of our fundamental difficulties. The methods used, the scope of the subject, and the point of view maintained are still open to variable interpretation. Considerable headway

has been made in the matter of agreeing to definitions and concepts, a progress that in view of the divergent traditional training of representative psychologists is in many respects astonishing, but much is still to be hoped for in other directions. There is no better way, however, to improve the presentation of the subject than by continued alteration of the presentation. The science, with its previous mistakes and also its present standards well in mind, is, as it were, continually re-writing its manuscript. Altogether the ideal text ought to be scholarly, unbiased, and pedagogically sound.

The author of the text before us is aware of the problem and willing to advance a solution. He believes that "too much stress is placed upon normal adult psychology (pure psychology) in our introductory courses," and therefore offers a volume which presents "a general survey of the science while still stressing the customary side of the subject." Accordingly a little less than a third of the book is devoted to a description of the fields of psychology outside that of the normal human adult and the remainder treats the material usually found in our texts. It would have been an interesting experiment if the author with a bit of daring had expanded the first part of the text considerably and had condensed the field of the normal human adult mind to about a third or even a quarter of the book. There is a distinct need for a book that shall give a survey of the entire general scope of the subject on the order of Angell's *Chapters from Modern Psychology* but with the intensive treatment of the present volume.

The fields covered in Part I are: animal, individual and applied, abnormal, and social and racial. Here again one might take issue with the author for his divisions and for their order, but in so new an undertaking almost any carefully thought out classification is as good as another. The reviewer could not, for example, agree with the author in casting out child psychology and physiological psychology for the reasons advanced. Historically by far the greater amount of material in child psychology that deserves the name of science has been done outside of the field of tests and by no means "all psychology seeks to correlate consciousness and physiological processes and is therefore physiological psychology in intent." Even the three Wundtian volumes practically dropped their physiological orientation after the first volume. The author is right, however, in insisting that logically at least, though not often in practice, genetic and comparative psychologies are points of view rather than separate segments of the whole subject.

It is not unnatural to begin the series with the animal field. The author's chief interest lies presumably there and the topic offers him one of the best opportunities of presenting psychology from the "objective" point of view. This pleases the student and at once postpones the main difficulty in the teaching of psychology. The author has already paid his respects to introspection as a method. In spite of its literal connotation in practice and in current usage it simply means "observation." In the reviewer's mind we should begin to dispense with the long paragraphs on the peculiar nature of introspection and perhaps, as one authority has already done with the term "consciousness," do away with it altogether. In regard to "structuralistic" and "behavioristic" contentions the author maintains an attitude of benevolent neutrality toward "behaviorism" because it "has the advantage" with the later reservation, however, that "it is much too early to decide between the two points of view." The chapter contains a review of well selected experiments on conditioned reflexes and on general and selective responses illustrating the sensory and motor capacities of various forms of animal life. The presentation is vitalized by a rapid fire of pointed questions and by frequent references to human analogies.

In the chapter on individual and applied psychology the author summarizes first of all the voluminous material that usually passes under the name of educational psychology and then completes the subject with a discussion in several sections of psychological applications to medicine and law, to education, and to business. Since the expansion of the field in industrial relations and enterprises is going on apace, a revision of the text done later might take such developments into account. One misses, too, some of the earlier work done in differential psychology at Columbia and a more than nominal mention of Stern's contributions. Closely allied is the chapter on abnormal psychology since some of the abnormal aspects of mind were just now treated under feeble-mindedness. But the reader might very well demand a stricter delimitation of the abnormal field. Why not include the material under feeble-mindedness? Or does the author seriously commit himself to the formula that mental disturbances are mental disintegrations, as he seems to do in the opening paragraph? The temporary character of the ailments or their appearance after a period of normal mental function is not a safe distinction nor one on which the authorities will agree. But then the author is not responsible because the

entire field needs to be thought out logically with definition, classification, and systematization in mind. Some attention is paid to the Freudian hypothesis and to the psychoanalytic method.

In the chapter on social and racial psychology the author discusses the behavior of the individual when under the stimulus of other individuals. The socializing tendencies of mind as well as the traditional influences of society are given a share in the *ensemble*. Under the former the author finds occasion to discuss the self including its development and under the latter custom and the mob are scrutinized. Racial psychology is covered briefly with a summary of the problems chiefly concerned with racial differences and the question of the influence of hereditary and environmental factors.

In Part II the author strikes boldly out in the traditional field of normal human adult psychology but in an untraditional manner: attention is the first subject. And not a bad idea! Most of the treatment follows the usual course, save where the degrees of clearness become degrees of effort in terms of motor accompaniments. This savors much of Mach's theory of the function of the *tensor tympani* and, indeed, of all shades of theory concerned with the motor explanation of attentive fluctuations. An excellent summary of the nervous system is provided together with clear diagrams of the main structures and connections. Then follow in order: reflex action and instinct, emotions, affective processes, sensory processes, imagination and the sequence of experiences, memory, and thinking. Important considerations which stand out in the development of the text are too many to mention in detail. Above all seems to be the author's gift of making the subjects presented very clear to the reader. An instance of this appears in the discussion of the James-Lange theory of emotions—the logic of the theory, its positive and negative criticisms, and its modern interpretations are all given in exemplary fashion. One misses Crile, however; but what does one not miss in a brief text? Under the pressure of brevity, too, in some cases the arguments assume the specious quality. In dealing with affective processes some interesting developments occur: clearness, location, and meaning are additional attributes. Affective processes may not be very clear, but to be conscious they must be somewhat clear; they have location because they almost always refer to the body, and they have meaning or significance. That is certainly an easy method of disposing of the problem of meaning, but can an attribute

of this character stand coordinately with the others which are pitched in the descriptive key? Quality, duration, intensity, and clearness, if you like, describe the process. Does meaning? It would be an interesting mental test to devise the categories of this new attribute. This confusion is emphasized later when we learn how sensory processes may develop through growth in meaning. In the auditory field the text offers an upper limit of 50,000 v. d. that in the light of recent research may have to be reduced. There is also no discussion of the important investigations on vowel tones. In describing visual sensations the traditional brightness value or tint becomes intensity. Is it not also confusing to denote protanopes as 'red-blind' and deuteranopes as "green-blind"? The book seems to thin out in the realm of the higher mental processes, although the material on memory and association is ample and clear.

Two very general criticisms: the book needs first of all a better underlying logic. Systematically it is not quite as connected as it might become. While the fields of psychology seem in a sense disjointed, it would appear possible to follow some logical outline in the presentation. In the second place it requires better balancing of sections. This has been indicated before. The impression that has repeatedly been made on the reviewer, however, is the grace with which the author has accomplished an inordinate amount of compilation. The assimilation in most places is excellent. The author has furthermore an unusual sense of pedagogical propriety without distortion of scientific fact. Each chapter ends with a concise and selected bibliography preceded by a summary and conclusion, and the entire volume closes with serviceably arranged authors' and subject indices. As a pioneer undertaking, it is a work of high merit.

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*Morale, The Supreme Standard of Life and Conduct.* G. STANLEY HALL. New York: Appleton, 1920. Pp. ix + 378.

Morale, as defined in Dr. Hall's latest book, is a combination of human efficiency and enthusiasm. On the one hand it is the "cult of condition," whose code is that of "personal and social hygiene," and on the other it is the urge to achievement. Morale "not only faces opportunities, but makes them." As a standard

of conduct it avoids the banal self-conscious morality of *conscience* and the deadening *Kultur* of the superman, while comprising the better aspects of both these standards.

The first half of the work traces the development of morale, chiefly American, in the Great War. Physical conditions such as health, food, and sleep are basic in morale. Soldiers are immunized against the demoralizing effects of fear by drill, diversion, examples of courage, resolution, fatalism, religion, and familiarity with terror. A kindred problem is that of steeling the soldier to the proximity of death, a specter which society has mollified by ceremonials, monuments and the like, but which the soldier must witness in its unmasked horror. The attitude of the nation adds a sublimity to the sacrifice of life. The author, however, deprecates spiritism as a sentimental antidote for the pall of death. The part played by anger, both in the nation at large and the fighting man, receives rather too brief a discussion.

Among the various stimulations of morale are songs (particularly home and love themes), humor and diversions in general. Humor releases the grim tensions of war. An account is given of the arousal of civilian morale by medals, placards, slogans, and war collections. On the side of *Kultur* there is reviewed the organization of our man power by mental and trade tests, ratings, and personnel classifications. Censorship in war should be thorough but intelligent; and the democratic soldier given all information practicable concerning the aims and progress of the war. Cowards for conscience' sake, and otherwise, contrast strongly with the soldier ideal—a man actuated by honor, *esprit de corps*, self-sacrifice for an ideal of defending the weak, rigorous and superb in discipline of mind and body. The difficult problem of soldiers and women is dismissed with an inadequate dogma of chastity. The Camp Greenleaf program of morale for favorably disposing the "draftee" to his new rôle is outlined, with a valuable suggestion added for morale specialists in industry, education, and other fields. Finally the author discusses the means of restoring of the morale of the wounded, the desponders as well as the parasitically minded who are too conscious of "having done their bit for their country."

In the second half of the book Dr. Hall extends the standard of morale to various social questions. The fundamentals of human desire must be studied in the labor problem; and profiteering is to be abolished by publicity and ridicule. The author's views on feminism are very suggestive. Psychoanalysis, applied broadly

throughout the book, is here given considerable rein. The modern woman should strive to be *equal* to the man, but not to be *like* him. Next to intelligently controlled procreation, it is the chief work of woman to bring to fullest expression the secondary qualities of sex in herself and especially in the male. By coyness and reluctance in sex relations woman has the power to evoke in man as sublimations ("long-circuiting") the traits of heroism, enthusiasm, and productivity—literary, scientific and moral. Darwin's secondary sexual characters are thus identified in social progress with Freudian sublimations. Unknown reservoirs of energy may be tapped by this principle. The author favors the rendering of divorce, in cases where interests of children are not at stake, more expedient and respectable.

In education methods, curricula, and faculties are in need of that humanistic enthusiasm and loyalty which are the very breath of morale, and which extend at present only to athletic sports and contests. Dr. Hall in dealing with "statesmen" revives the old social organism metaphor under the modern guise of psychoanalysis. The maladjustment of the neurotic individual is projected into the body politic. Hence it comes that our legislators faced with the grave crisis of decision regarding the League of Nations, have reverted to infantilism. They choose to remain in our juvenile isolation from Europe so as to escape the "growing pains" of trans-Atlantic responsibility. Other neurotic trends emerge, such as frightened exaggeration of details in the treaty, and blinding absorption in self. There is a piquant justice in the comparison.

The discussion of morale and prohibition is somewhat reactionary, especially the defense of that "poor man's club," the corner saloon. The present writer doubts whether the social morale of this obsolete institution ever rose much above the level of the discussion of gang politics and prize-fights. The tribute to the morale of the American voter in the abolition of his personal beverage for the common good Dr. Hall leaves unmentioned. The tenets of Bolshevism are well summarized as well as the necessity for freely developing Nature's individual differences among men. The Soviet scheme is meritorious, not in its leveling and confiscating policy, but in fostering the reorganization and morale or industrial and trade groups, making them functional units in representative government. Finally religion too must be reorganized for modern needs. Immanence, in the concepts of reason,

science, psychoanalytic release, and libido, must replace the transcendence-dogma of blind faith, Heaven and Hell, sin, prayer, and love of an objective deity. A useful descriptive bibliography is appended.

Although the author's concept of morale in the army is quite clear, when applied to social problems as a standard it lacks definition. To one who has served in it, the military regime is very different from the social. The army in the field exhibits *esprit de corps*, coöperation, and competition for excellence in both "condition" and "achievement" to a degree almost unknown in peace-time society. There is also the abnegation of self-interest in the motor attitude of obedience through superiors to the will of the army and the nation and to the larger ideal of the war. Thus selfish inhibitions are removed and true morale is possible. These factors, while not entirely neglected by Dr. Hall, receive far too little attention. Morale is condition and enthusiasm, not undirected, but for some definite social purpose. The fact that an army is united in a common cause, that it represents one hundred per cent. socialization, is the *sine qua non* of its morale. In proportion as a nation is characterized by the concert of individual activities for social ends, it is likely to be characterized also by morale. Morale, in other words, is the condition which arises when people unite to achieve some common goal; it is not the goal or standard in itself.

FLOYD H. ALLPORT

*The Group Mind. A Sketch of the Principles of Collective Psychology with some attempt to apply them to the Interpretation of National Life and Character.* WILLIAM MCDOUGALL. New York: Putnam, 1920. Pp. xxii + 418.

Professor McDougall's *Introduction to Social Psychology*, published in 1908, proved to be one of the most fertilizing books in the social sciences of recent years, and in that sense was epoch-making.

The present work, he tells us in the Preface to the American Edition, represents the second step in the writing of a comprehensive treatise on Social Psychology, of which the *Introduction* was the first. In this new book he sketches the principles of the mental life of groups and attempts to apply these principles to the understanding, in particular, of the life of nations.

In a brief introduction the author takes up the province of collective or group psychology, examines the conception of a group mind, and the relations of social psychology to other social sciences. After this he outlines the general principles of collective psychology as shown in the mental life of the crowd and of the highly organized groups. The author then proceeds to the study of national mind and character, discussing successively the concept of a nation, the mind of a nation, freedom of communication as a condition of national life, the part of leaders in national life, the will of the nation, and the rôle of ideas in national life. In a concluding section he discusses the various factors which enter into national development. Race and environment, he finds, are the fundamental factors, but the intermixture of races, social traditions, social organization, the cross-fertilization of cultures, and the development of the higher spiritual values are important.

Group Psychology the author makes a distinct field within social psychology. Social psychology studies the reciprocal influences of the individual and the society in which he plays a part. Collective or group psychology is that part of this field which studies the mental life of groups of all kinds. It itself consists of two parts, that which deals with the most general principles of group life, and that which applies these principles to the study of particular groups. The tasks of group psychology, according to Professor McDougall, are to examine the validity of the conception of a group mind, to set forth the general principles of collective mental life, to distinguish the principal types of collective mental life, to describe the peculiarities of those types and as far as possible to account for them.

The author does not discuss whether such group psychology is a part of psychology in the proper sense, or a part of sociology. He evidently, however, assumes that it is a part of psychology, as he holds that sociology is a synthetic science which takes a comprehensive view of the life of mankind, making use of the conclusions of many sciences; but among these, he thinks, group psychology is probably the most important. This is in sharp contrast to the position of Professor Giddings who holds that sociology is "the psychology of society."[1] It also differs from the position of those earlier psychologists, like Baldwin, who held that psychology concerned itself with the individual, while sociology concerned itself with the group.

[1] See his article on "Pluralistic Behavior" in the *American Journal of Sociology*, January, 1920, p. 388.

In criticism of Professor McDougall's position it may be pointed out that any psychology of group behavior, if scientific, must necessarily be synthetic in character. It must take into account biological conditions, geographical conditions, economic conditions, etc., as well as the social tradition and the social mind. This, indeed, is exactly what Professor McDougall himself does in his treatment of group psychology. In pointing out the synthetic character of sociology, therefore, he has made no clear distinction between group psychology and sociology. If there is any such distinction Professor McDougall offers no convincing demonstration. To the careful student of society it would seem, indeed that the psychology of group behavior in any given situation is inextricably bound up with historical, biological, geographical, economic and many other conditions. The careful consideration of all of these influences, if possible with some quantitative analysis of them, is indeed just what is necessary to make any science of collective behavior truly scientific. This is the program of the sociologist, but as yet many group psychologists do not seem to sense the difficulties of the task which they are undertaking.

Indeed, as one reads through Professor McDougall's book, one is impressed that it is the premature deliverance of thought which might have been made much more valuable and scientific if it had been allowed to mature. The reviewer is, in general, in sympathy with the author's psychological point of view and approach to the problems of group behavior. Indeed, he would hold that it is the only scientific point of view. He regrets, therefore, to be compelled to criticize the detailed handling of problems in the work under discussion. Professor McDougall shows a good knowledge of the work of the older British and Continental social theorists, his work being especially influenced by the French social psychologists. But he pays little attention in general to recent works. One is amazed to find him taking the theories of such a man as Buckle, who lived in a pre-psychological age, seriously. On the other hand, there is no mention of the remarkable work of Professor C. H. Cooley along the very lines which Professor McDougall undertakes to study.[1] If the reviewer is not mistaken, Professor Cooley's work in social psychology and in sociology in the years to come will be recognized as scarcely less important than Darwin's was in biology. One might as well overlook variation and selection

[1] Miss Follett's book, *The New State*, which Professor McDougall praises, is largely based upon Cooley's work.

in biology as neglect Cooley's doctrine of the importance of primary groups and of inter-communication in social psychology and in sociology.

This brings us to what seems to the reviewer the fundamental criticism of Professor McDougall's book, namely that he takes the crowd and its phenomena as the starting point for the interpretation of group spirit, whether in natural or in artificial groups. This is of course, the point of view of the French school. In contra-distinction, Professor Cooley would take the primary groups of men, especially the family and the neighborhood groups, as the starting point for understanding the whole process of interaction between individuals and, hence, collective behavior. Professor McDougall, to be sure, emphasizes the great difference between an amorphous crowd and a highly organized group, like, say, an army. Nevertheless his whole approach to the problems of national life and character are essentially through crowd psychology rather than through the psychology of small, primary, face-to-face groups. There can be little doubt that the contention between these two schools of social interpretation is destined to play a considerable part in the near future in social psychology. The school of mechanistic objective determinists will also have to be reckoned with, though Professor McDougall pays it no attention at all.

There is much of value in Professor McDougall's book, and the above strictures should not be taken to mean that the reviewer does not fully recognize its value. As a pioneer psychological treatise on national mind and character it will probably take the same place which the *Introduction to Social Psychology* took as a pioneer treatise in its field.

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S. W. FERNBERGER. *Interdependence of Judgments within the Series for the Method of Constant Stimuli. J. of Exper. Psychol.*, 1920, 3, 126–150.

This experimental investigation was devised to ascertain whether there was operative, for the method of constant stimuli, any effect of one judgment upon another within the series. In such experiments stimuli of varying intensities are compared with the standard stimulus, and one might surmise that an experiment may have

some influence on the judgment passed on the one following. Such an influence must show itself in the relative frequencies of the categories of judgment.

Fernberger experimented with lifted weights using the turning top table. The standard was 100 grs., the comparison stimuli 88, 92, 96, 100, 104 grs. The results of the 96 and 100 grs. pairs are most likely to show the influence of this factor. In the first series (Series A) these pairs followed the 104 grs. pairs, while they followed the 88 grs. pairs in the second series (Series B). Two such series were taken simultaneously in order to make the results directly comparable. There were, therefore, ten pairs of weights presented to the subject. The arrangements of these stimuli were changed in order to prevent the observers from learning the order of the weights. The stimuli were presented to the subject in an unbroken series. This had to be divided subjectively into pairs, and the subject was instructed to judge each second weight in terms of the standard which just preceded it. The instruction emphasized the fact that each comparison stimulus had to be judged solely in terms of its own standard stimulus. For every comparison stimulus 500 experiments were made. At the end of this group of experiments, 50 more judgments, with knowledge of results, were taken with each one of the four observers. This gives a total of 22,000 individual judgments as the empirical basis of this paper.

The results obtained are tabulated in detail so that one can check up every step of the argument. The relative frequencies make it evident that the order of the series of stimuli has a marked effect upon the relative frequencies of the categories of judgment. When the 96 and 100 grs. pairs followed the 104 grs. pairs, there was a strong tendency for them to be judged "lighter." When they followed the 88 grs. stimuli there was an equally strong tendency for them to be judged "heavier." The statistical tables are supplemented by graphs which Fernberger plots for his four subjects, which show at a glance the general trend of the results.

The next step consists in studying the effect of these differences of the observed relative frequencies for the two series on the constants of the psychometric functions, on the values of the thresholds, on the point of subjective equality, and on the interval of uncertainty. These quantities are given separately for each subject and for every fraction of 50 judgments into which the complete data are divided. It is found that the coefficients $h$ for the "lighter"

judgments for Series A are almost invariably smaller than the corresponding values for Series B. The coefficients $h$ for the "heavier" judgments of Series A are usually smaller than the corresponding values for Series B. The difference of the lower and the upper thresholds S and S for Series A and B is very striking. Both values are less for Series B than for Series A. In all the cases the amount of shift of the upper threshold is greater than that of the lower threshold. From this it follows that a change of order has a greater effect on the upper than on the lower threshold. It is shown that the observed differences of the size of the interval of uncertainty are significant.

The most striking difference is found in the position of the point of subjective equality. In every fraction for every subject the point of subjective equality for the Series B is lower than the corresponding value for Series A. The average difference for all four observers is 2.87 grs. with an index of significance of 0.9949. In calculating this coefficient no account was taken of the fact that these differences have the same sign in all the series. Taking this into consideration one must assign to the coefficient of significance the value 1, *i.e.*, the experimental evidence shows conclusively that every experiment has some influence on the one following.

At the end of this group of experiments the observers were informed of the difference of the judgments in Series A and B. Then an additional series of 50 experiments with each comparison stimulus was taken, in order to ascertain whether such knowledge has any effect on the judgment. It was found that this instruction has practically no influence on the judgment, from which it follows that this influence can not be eliminated by simply instructing the subject not to let the judgment be influenced by the one given in the preceding experiment.

One may say in general terms that there exists some sort of contrast effect between the stimuli. Further investigation has to show the exact nature of this influence. It is possible that there exists a type of expectation which tends toward a reversal of judgment from one pair to the one succeeding. When the subject gives a "lighter" judgment he is by doing so "set" toward a tendency to give a "heavier" judgment of the next pair. If this be so this "set" is not a conscious process. All the subjects were surprised on hearing the significance of the statistical data obtained from them, and all insisted that such a form of expectation was not consciously present.

It would not be difficult to suggest other plausible explanations. As long as no further information is at hand our judgment must remain in abeyance, and it is safest to speak in general terms of a contrast effect between the stimuli, leaving it undecided whether this "set" consists in a mental process or in some sort of physiological disposition as, *e.g.*, a muscular adaptation which persists after lifting a weight.

Fernberger's observation ought to be the starting point for a number of investigations. Whatever the nature of this contrast effect may be, it is likely to depend on the time-interval between two experiments. This might be investigated by allowing a time-interval of varying length to elapse between two experiments instead of presenting the weights in an unbroken series. Presumably the contrast effect will grow smaller the longer the interval between the experiments and disappear entirely when this interval exceeds a certain length. Experiments of this kind should give good opportunity for introspecting and for analyzing the conscious process of judging.

F. M. URBAN

BRÜNN

G. D. H. COLE. *Social Theory.* New York: Stokes, 1920. Pp. 220.

J. J. FINDLAY. *An Introduction to Sociology.* New York: Longmans, Green, 1920. Pp. xi + 304.

The above two books are good examples of contrasted methods among contemporary English social theorists. Mr. Cole, who is the leading thinker of the English guild socialists, follows the old method of deductive analysis employed by Rousseau and by so many of the political and economic thinkers of the nineteenth century. He makes little use of psychology or of any modern science. Indeed, he complains that social psychology is either "mob" psychology or an unsatisfactory study of the psychological aspects of complicated and highly developed groups. Hence he practically ignores it. It is no wonder that he decides that the study of the family forms a part of the study of individual conduct rather than of social conduct!

Professor Findlay, on the other hand, who is professor of education in the University of Manchester, builds his little text-book

upon the results of modern science. He bases his work especially upon that of Professor Cooley, to whom, he says, the book "owes much." Like Cooley, Professor Findlay would make the life of primary groups, especially the family and the neighborhood, central in social psychological study. The social process he finds to be essentially a process of communication, and hence social progress depends largely upon the growth of communication. Starting from these two fundamental perceptions the author builds up a careful and scientific, if not very original, psychological analysis of group behavior and organization. The book is noteworthy because it indicates that at least in a small group of English social thinkers American, rather than French, social psychology is beginning to take the lead.

CHARLES A. ELLWOOD

UNIVERSITY OF MISSOURI

J. B. BURY. *The Idea of Progress. An Inquiry into Its Origin and Growth.* London: Macmillan, 1921. Pp. xv + 377.

This is an historical rather than a psychological work. But it is a work which no social psychologist can afford to overlook. It not only traces the origin and growth of one of the ruling social ideas (or "socio-psychic dominants") of our age, but by its very criticism of that idea raises some of the deeper problems of social psychology.

CHARLES A. ELLWOOD

UNIVERSITY OF MISSOURI

RICHARD H. PAYNTER, JR. *A Psychological Study of Trade-Mark Infringement. Archives of Psychology*, 42. New York: Science Press, 1920. Pp. iv + 72.

The reader desiring an introduction to the psychology of trade-mark infringement will find this study very illuminating but,—if he is not wary, very confusing. The first third of the study is devoted to an historical account of the development of the subject and comprises a rather comprehensive review of previous literature. Fully nine pages of this section are given to an analysis of a study made by Dr. Gustave A. Feingold. The upshot of this painstaking analysis is the conclusion that the psychology of trade-mark infringement is not concerned with the degree of physical similarity which may *seem* to exist between trade-marks but with the actual confusion created in the minds, or rather responses, of the observers.

Once this important and readily acceptable proposition has been established, the writer proceeds to describe his own methods, —the recognition method and the order of merit or relative position method. In the former a number of typewritten trade-marks were shown to the subjects in the experiment, after which the same trade-marks with their imitations were given to the subjects who were then asked to sort them into seven piles according to the degree of certainty with which they recognized each trade-mark. There were three groups of subjects, an uninformed group, an informed group, and a control group. The degree of confusion between trade-marks was found to vary over a wide range, but was higher in the uninformed than in the informed group.

From his results, Paynter concludes that there is no clear cut division, such as is implied by legal procedure, between trade-marks likely to deceive and those not likely to deceive. This conclusion we may readily accept, but when the writer goes on to infer that "the construction of a psychological scale for the measurement of deceptive similarity of two trade-marks would be the most scientific way of determining the question of infringement" (p. 52), and particularly when he describes the make-up of such a scale, it becomes impossible to follow him. "Those trade-marks" he says, "composing the scale should be so selected after experimentation that only infringements should lie in the illegal and non-infringements in the legal limits." He also believes that such a scale should contain all degrees of confusion, from 0–100 per cent., and that "the difference between the degrees should be equal or very nearly so"; also that "an absolute scale would be preferable, as it would be more reliable."

A detailed analysis of the above statements is impossible here, but it is obvious from these and similar statements that the writer lacks an appreciation of the theoretical implications of his experimental study. It is a long step if not an impossible step from his experimental results or from any other psychological study of the subject to the kind of scale which he discusses. Indeed, the writer seems to be unduly obsessed by the importance of measuring scales in psychology. For, after naming a list of psychologists who have developed scales and after enumerating some of the scales, he concludes: "There are now at least 29 mental scales in use." Evidently he believes that there should be at least thirty.

On the other hand, Paynter's study does show that a method or technique by which to determine degrees of confusion experi-

mentally is a practical possibility. Many problems must be solved before this possibility can be realized. For example, should the degree of confusion be based upon typewritten samples of trade-names alone, as in Paynter's experiments, or upon the trademark as it actually appears in print, or upon the spoken trade-mark, or upon all three? A few practical questions like these immediately complicate the problem.

By the use of the relative position method, Paynter found degrees of confusion which agreed rather closely with the results in the recognition experiments. It is to be expected that subjects of a certain intelligence would be able to estimate at least crudely the confusion which certain trade-marks would create in actual experience. Further experiments are needed, involving more of the actual elements in trade-mark recognition, and including a greater range of subjects, before psychologists can accept the short cut of the relative position method.

A rather trivial but irritating feature of this study are the patronizing comparisons made between the legal and psychological procedure, the numerous platitudes on the relative value of objective and subjective judgments, and the extravagant claims made for the psycholocical method. If this study is intended for psychologists, all but the briefest mention of these facts is superfluous. If it is intended for the legal profession, the psychology of trade-mark infringement is still so far from filling the gap which this study emphasizes, that a little more modesty would be in order.

Indeed, the *Psychology of Trade-Mark Infringement* is far too comprehensive a subject. It would be more practicable for psychology to emphasize the investigation of "trade-mark confusion." The psychology of trade-mark confusion is no mean field and at least it offers some possibility for a scientific technique. When a practical technique in this field has been developed, the psychologist may begin to apply his standards to the problems of infringement. Paynter's study is valuable for the ground it breaks in preparation for the development of such a technique.

HENRY C. LINK

COBB, M. V., & YERKES, R. M., *Intellectual and Educational Status of the Medical Profession as Represented in the United States Army. Bull. of the Nat. Research Council*, 1921, I, Part 8.

This report of the statistical study of the records of about 2,500 medical officers is the direct result of the critical interest

aroused among the medical profession at the findings of Col. Shaw in his report to the Surgeon General in November, 1917, based on psychological examinations in the U. S. Army which indicated that the intellectual status of the medical officers was lower than that of officers in other branches of the service. The present research covers data secured during 1917–18, in a large number of army camps which is undoubtedly a fair representation of all the officers in every branch of the army. The group examination, Alpha, was used in examining the soldiers. Items of information of prime importance concerning each individual include, among other things, pre-medical education, medical school attended, intelligence grade, years of medical experience, geographical location, and annual earnings. In analyzing these data the investigators have attempted to give principal facts concerning the medical officers themselves, the relations of these facts to each other, and their significance for medical education and the profession in general.

It is a detailed analytical study, liberally supplied with tables of distributions for each field, and graphs which tell their own story. The investigators have left no stone unturned in giving the doctors a fair hearing. A summary at the beginning of the article assembles these findings, together with their interpreted significance. The medical officers rate intellectually on a par with the Quartermaster Corps whose rating is lower than that found in any other branch of the service except the Dental and Veterinary. Each arm has its characteristic psychograph (curve representing scores in the eight different types of test of the Alpha) which differs widely from every other arm, that of the doctors and the engineers being almost exactly inverse, but there is striking similarity between the curves of the several special medical groups. For in order to ascertain whether the medical psychograph was characteristic of the medical profession, the records were further subdivided into specialties represented, and there appeared an almost startling uniformity. This would indicate development of specialized intellectual functions for different professions or vocations.

It is suggested that responsibility for the low rating of the medical men is dependent upon the following factors: age, medical military selection, habits of deliberateness and accuracy acquired in the medical training and practice, and character of the tests themselves which are more in line with the work of engineers than of doctors. A subdivision on the age basis showed obvious differences which would suggest that age may influence the curve. Since

the median age of the officers of the Medical Corps was 37.6 as opposed to 28.8 of all the officers, and since a study, illustrated in table form, on the relation of age to intelligence of all officers reveals a negative correlation of age with intelligence rating, applicable to men over 26 years, we may conclude that the medical showing was held down partly for reasons of age. The writers then discuss briefly the value of various factors which would creep in to modify age performance record and show also that too much importance has been attached to the plea of deliberateness and accuracy versus speed and agility being responsible for the lower scores. There is no support in favor of the assumption that the tests were less applicable to the medical than to the other army corps. Because of the imperative need for doctors, appointments were made, not by the weeding out process of the officers' training school and strict examination, as in the other arms of the service, but directly on basis of age, certification by the American Medical Association, and only sometimes by professional examination. This undoubtedly influenced the general intelligence level of the medical corps as compared with that of the more hand picked groups.

A geographical classification, either of training school and graduation or of field of medical practice, reveals substantial differences in intelligence level, earnings and experience. Generally speaking, superiority in these respects rests with the northeast, central and northwest sections of the country. Intelligence and earnings vary also for rural, urban and metropolitan districts. Intelligence is highly correlated with rank and promotion in the Medical Corps.

The statistical study concerning medical schools resulted in five classifications: geographic location, size (according to registration in 1916–17), entrance requirements, American Medical Association rating, and medical sects. Again the northeast, central and northwest sections show an advance over the south and south central sections in the matter of intelligence rating and earnings of their graduates. The larger institutions, on the whole, turn out better intellectual product than the smaller, but there is no correlation between size of college and size of income. A high entrance requirement, as in the case of Johns Hopkins and Harvard, bespeaks for its graduates high intelligence scores and larger earnings. The difference between first and third class schools rated by the American Medical Association, although significant, is not so striking as that between highest and lowest entrance requirement. Homeopathic

schools were represented in earnings and intelligence, by better men than were eclectic schools, the regulars taking a midway position, possibly because homeopathic physicians may have been more carefully scrutinized and selected before being commissioned in the army. The southern schools on the whole, show lower scores, less schooling, lower earnings and fewer promotions than the northern. Seven schools secured, through the representation of their graduates, a median intelligence rating of A.

The report is worth very careful study. It also points to different directions where further research would be advisable and desirable, such as an intensive study of the psychographs of the different professional groups, already available through the army, and psychographs for corresponding student groups in various schools, to determine characteristicity. If there is agreement, this might suggest its applicability in vocational guidance; if disagreement, which points to the result of professional training and practice, it might yield suggestions for educational methods, both of which conditions would serve to improve the status of the medical profession.

SCHWESINGER

RADCLIFFE COLLEGE

# OBITUARY.

## THEODORE FLOURNOY (1854–1920)

With the death of Flournoy, in November 1920, another one of the few remaining pioneers of scientific psychology has gone. To most of us he is known as editor, with Claparède, of the *Archives de Psychologie de la Suisse Romande* and as the author of a number of remarkable studies in domains in which the scientifically minded researcher rarely ventures. *Des Indes à la Planète Mars* (1900), *Esprits et Mediums* (1911), *Une Mystique Moderne* (*Archives*, 1915), have no superior in point of critical acumen, broad mindedness and talent of exposition. But, whatever the value of those studies, his place in the history of modern psychology is marked rather by his forceful plea, in 1891, for a psychology conceived as pure natural science, i.e., as independent of any metaphysics,—a plea which resulted in the immediate foundation of a chair of psychology in the Faculty of Science of the University of Geneva. This was probably the first time that psychology was officially recognized in this manner as an independent science.

Flournoy was the first occupant of the new chair. The laboratory which he founded in connection with it was, however, soon turned over to his younger colleague, Claparède; for, like so many other champions of experimental psychology, Flournoy felt unbearably cramped by the narrowness of its scope. He understood his friend Wm. James when he wrote, speaking of his own laboratory work, "Ca tourne au cauchemar!"

Between James and Flournoy there were striking points of resemblance. Both began with the study of medicine and both turned early from physiology to psychology; both wearied rapidly of laboratory research, and both became increasingly interested in philosophical problems. The ideas of the Swiss psychologist were on many problems so near to those of James, that in *La Philosophie de Wm. James* (1911), it is at times difficult to tell when Flournoy expounds the views of the great American and when his own.

Productive as he was in academic pursuits, Flournoy did not let himself be absorbed entirely by them. The social and, in

particular, the religious problems of the country in which he lived never left him indifferent. Every worthy cause found him ready to give of his best. He is mourned in death, as he was honored in life, not only by his academic colleagues but also by his fellow citizens who regarded him as a good and wise man.

JAMES H. LEUBA.

BRYN MAWR COLLEGE.

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# NOTES AND NEWS

Dr. James Rowland Angell, formerly professor of psychology at the University of Chicago and more recently head of the Carnegie Corporation of New York, has been elected president of Yale University.

Dr. J. D. Morgan has been appointed psychologist at the clinic and also at the psychiatric hospital of the University of Iowa. Dr. Morgan is at present stationed in the Hawaiian Islands engaged in army hospital reconstruction work.

Dr. Edward A. Spitzka assumed his new work in the Neuropsychiatric section, medical division, War Risk Insurance Bureau, Washington, D. C. on March 1st.

At the University of Cambridge, Dr. C. S. Myers, Gonville and Caius College, has been appointed reader in experimental psychology.

Dr. K. M. Dallenbach of Cornell University has been made an assistant professor of psychology at that institution.

Dr. F. L. Wells of the Boston Psychopathic Hospital has been appointed instructor in experimental psychopathology at the Harvard Medical School.

Dr. John E. Coover of Stanford University has been promoted to the rank of associate professor.